

Montana Hospital Discharge Data System

Surveillance Report

May 2012



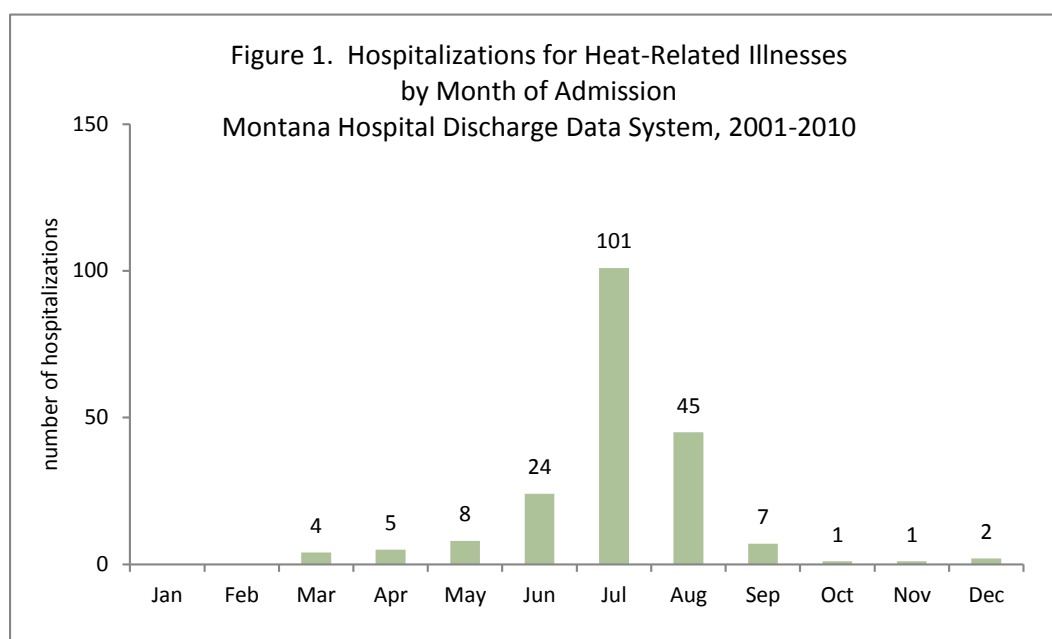
Hospitalizations for Heat-Related Illnesses in Montana, 2001-2010¹

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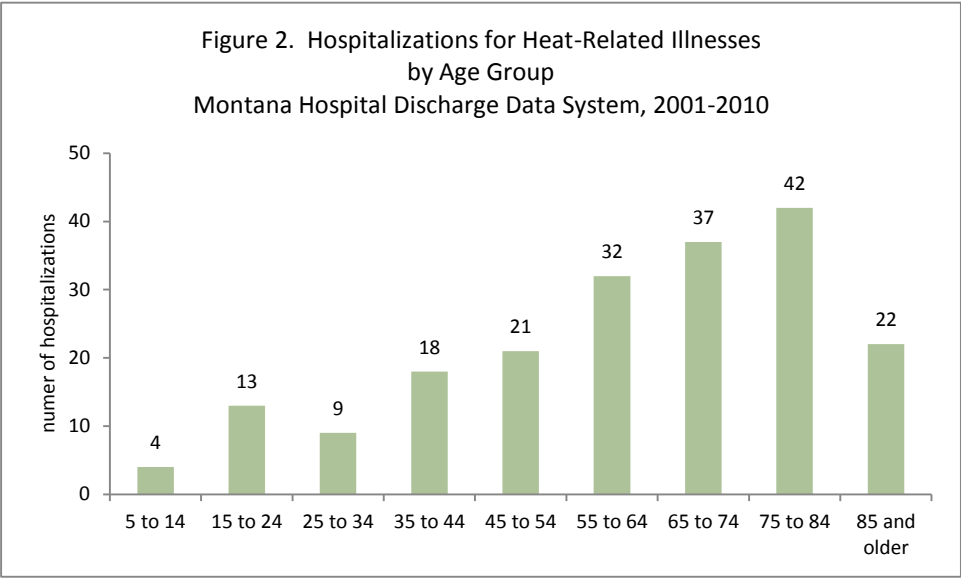
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Montana is a state of extreme temperatures, from well below zero in winter to occasional days over 100 degrees in summer. There have been several record hot summers in the past few years.² Most Montanans recognize the dangers of cold temperatures but may not have the same concern for heat. Fortunately, only six deaths were attributed directly to heat exposure between 2001 and 2010, although heat was mentioned as a contributing cause for six more, with underlying causes of cardiovascular disease (n=3), stroke (n=1), chronic obstructive pulmonary disease (n=1) and acute renal failure (n=1).³ This is consistent with national patterns of finding heat as a contributing cause for deaths from chronic disease.⁴

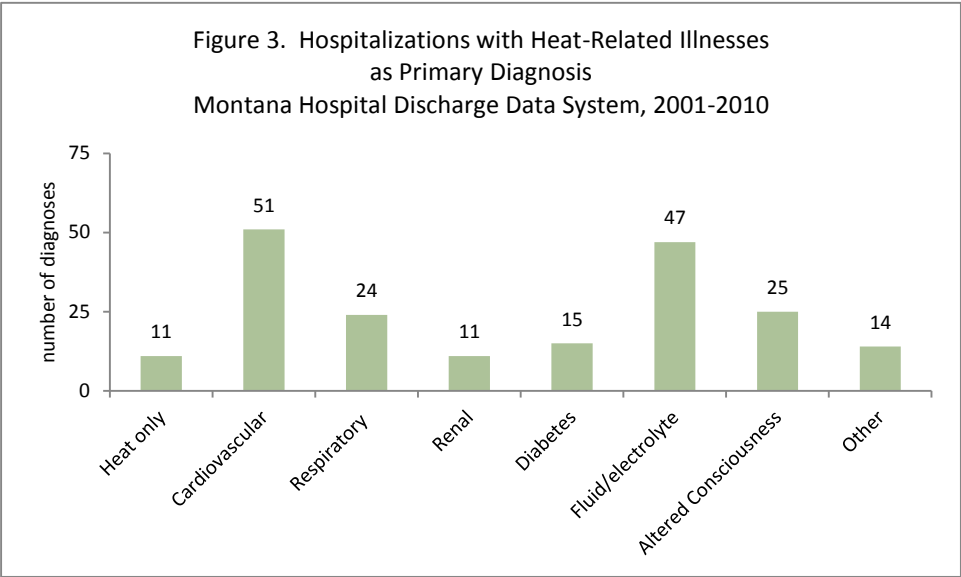
Between 2001 and 2010, a total 198 individuals were admitted to Montana hospitals with a primary (n=99) or secondary diagnosis (n=99) of heat-related illness, based on ICD-9-CM codes 992.0 through 992.9 for primary or secondary diagnoses and E900.0 through E900.9 for External Causes of Injury codes (E-codes).⁵ Most of these hospitalizations occurred in July, followed by August and June, although a few occurred in cooler months (Figure 1).



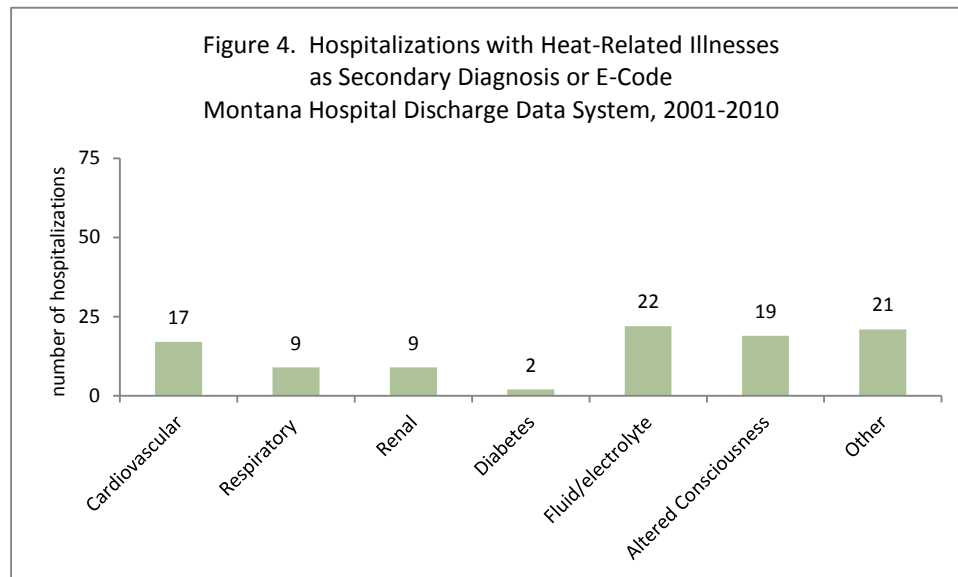
The median age of patients was 67 years and only 9% were younger than age 25 years (Figure 2). Two thirds were male.



Only 11 of the 99 patients with primary diagnoses of heat-related illness had no other complications or comorbidities (Figure 3). The remaining 88 admissions with primary diagnoses of heat-related illness had one or more secondary diagnoses. (The secondary diagnoses included in Figure 3 sum to more than 88 because most patients had more than one.) Fluid and electrolyte imbalance and altered consciousness (dizziness, confusion, light-headedness, fainting, disorientation, visual disturbance) may be directly related to heat stress, but there were 101 secondary diagnoses of cardiovascular, respiratory, or renal disease or diabetes. A few patients had a variety of other secondary diagnoses, including alcohol abuse, injuries, headache, gastrointestinal distress, or musculoskeletal symptoms; the latter three are often associated with heat stress.



An additional 99 patients were admitted with other primary diagnoses, with heat-related illness or heat stress noted among the secondary diagnoses or E-codes (Figure 4). The most common non-heat primary diagnosis was fluid or electrolyte imbalance, followed by altered consciousness, both of which could be interpreted as consequences of heat exposure, as could some things included in the other category. However, more than one third of patients were admitted with primary diagnoses of cardiovascular, respiratory, or renal disease or diabetes. These chronic conditions are especially vulnerable to, and may be seriously exacerbated by, the cardiovascular and hemodynamic changes caused by heat stress such as increased heart rate, altered blood flow distribution, dehydration, and electrolyte imbalance.



Patients age 65 years and older were more likely to have primary or secondary diagnoses of cardiovascular or respiratory disease than younger patients (Odds Ratio 1.90, 95% Confidence Interval 1.39-2.59 for cardiovascular disease; and OR 1.35, 95% CI 1.14-1.57 for respiratory disease).

Apart from age and certain comorbidities, there were no data in the hospital discharge data set about risk factors for heat-related illnesses. People can experience heat stress during vigorous activity in recreational and occupational contexts, as well as in sedentary pursuits in enclosed and poorly ventilated buildings or vehicles. E-codes would be very helpful, but only 46 of the 198 records included any E-codes, and 37 of those indicated heat stress as contributing to other primary diagnoses. Only three of 198 records contained informative E-codes, which included (1) heat stress associated with a parked motor vehicle; (2) medications and overexertion plus heat stress contributing to a fall; and (3) a December event coded as occurring indoors, attributed to a mechanical heat source (furnace or boiler room). There were no other indicators for circumstances of the heat exposures, such as recreational or occupational, or location such as home, vehicle, or outdoors.

The majority of contacts with the health care system for heat-related illnesses occur in Emergency Departments (EDs) or in walk-in clinics; relatively few are admitted to hospitals. There are typically between

two and five ED visits for heat-related illnesses for each admission.⁶ Nearly two thirds (62%) of patients in this analysis were admitted through an ED, consistent with national experience,⁷ but we do not know how many Montana patients were treated in an ED and released.

This analysis of Montana hospital admissions for heat-related illnesses is consistent with many other reports that people age 65 and older, and those with chronic diseases, are at particular risk for serious adverse sequelae of heat exposure.⁸ Heat stress may be a primary cause for admission or may contribute to the worsening of another health problem.

Many cases of heat stress are preventable by moderating activity, seeking shade or cool environments, and maintaining hydration.⁹ However, athletes and workers may be pressured to perform beyond their tolerance levels. Children and the elderly or chronically ill may be unaware of impending heat stress and young children in particular may be unable to mitigate their own circumstances. Because heat stress can be accompanied by altered perception and judgment, people should watch those around them for signs and symptoms of heat stress and help them take steps to prevent progression.



¹ The Montana Hospital Discharge Data System (MHDDS) receives annual de-identified hospital discharge data set through Memoranda of Agreement with the Montana Hospital Association and the Montana State Hospital at Warm Springs. Most hospitals in Montana participate in voluntary reporting of discharge data from their Uniform Billing Forms, version 2004 (UB-04). The MHDDS receives information on more than 95% of the inpatient admissions in the state.

² <http://www.cfc.umt.edu/MCO/NWSForecasts.aspx>

³ Montana Office of Vital Statistics

⁴ <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5529a2.htm>

⁵ <http://icd9cm.chrisendres.com/>

⁶ Knowlton K et al. 2009. *Environ Health Perspect* 117:61-67; Florida Department of Health, <http://www.myfloridaeh.com/newsroom/Heatillness.pdf>

⁷ Merrill CT et al. 2008. HCUP Statistical Brief # 55, <http://www.hcup-us-ahrq.gov/reports/statbriefs/sb55.jsp>

⁸ Zanolotti A et al. 2012. *Proc Natl Acad Sci USA* 109:6608-6613.

⁹ <http://emergency.cdc.gov/disasters/extremeheat/>

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